



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/895,152	07/02/2001	David R. Brown	2119-0160P	9526

7590

10/08/2003

Patent Administrator  
Mems Optical, Inc.  
205 Import Circle, Suite 2  
Huntsville, AL 35806

EXAMINER

CHACKO DAVIS, DABORAH

ART UNIT

PAPER NUMBER

1756

DATE MAILED: 10/08/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/895,152

Applicant(s)

BROWN ET AL.

Examiner

Daborah Chacko-Davis

Art Unit

1756

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 17 September 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-35 is/are pending in the application.
- 4a) Of the above claim(s) 29-35 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-28 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All   b) ☐ Some \*   c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

**DETAILED ACTION**

***Election/Restrictions***

1. Applicant's election without traverse of Group I (claims 1-28) in Paper No. 8 is acknowledged.

***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1-7, and 23-28, are rejected under 35 U.S.C. 102(e) as being anticipated by U. S. Patent No. 6,411,642 (Mazed).

Mazed, in col 2, lines 50-55, in col 7, lines 37-59, in col 8, lines 1-57, discloses a method for fabricating a mask comprising coating a phase-shift blank (substrate) with a light sensitive material such as photoresist, performing multiple passes (at least four passes constitutes four exposed regions such that no two passes write along the same path) onto the photoresist to form a desired pattern on the photoresist and developing the photoresist layer (claims 1, 3-5, and 23-26). Mazed, in col 29-38, discloses that the photoresist material is developed and subsequently etched (claims 2, and 27). Mazed, in col 8, lines 8-14, discloses that the photoresist is exposed by performing multiple

Art Unit: 1756

passes using electron beam lithography (claim 6). Mazed, in col 8, lines 10-14, discloses that the stitching error and non-uniformity is reduced (claims 7, and 28).

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 8-22, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 6,411,642 (Mazed) in view of U. S. Patent No. 6,071,652 (Feldman et al)).

Mazed, in col 2, lines 50-55, in col 7, lines 4-13, and lines 37-59, in col 8, lines 1-57, discloses a method for fabricating a mask comprising coating a phase-shift blank (substrate) with a light sensitive material such as photoresist, performing plurality of passes (at least four passes constitutes four exposed regions such that no two passes write along the same path) by direct writing onto the photoresist to form a desired pattern on the photoresist and to reduce non-uniformity and stitching errors, and developing the photoresist layer. Mazed, in col 29-38, discloses that the photoresist material is developed and subsequently etched. Mazed, in col 7, lines 4-15, discloses that the grating patterns are exposed onto the wafer through a mask (claims 8, 10-11, and 21-22). Mazed, in col 8, lines 39-48, in col 10, lines 65-67, and in col 11, lines 1-23, discloses that the exposed photoresist is developed and etched to form a grating of finer

Art Unit: 1756

pattern on the substrate (microstructure) (claim 9). Mazed, in col 10, lines 1-5 discloses that the photoresist is heated for about an hour.

The difference between the claims and Mazed is that Mazed does not disclose that a portion of the photosensitive material is melted to reduce roughness error. Mazed does not disclose that the step of melting comprises a step of heating the photosensitive material for a period of time (claim 12). Mazed does not disclose the photoresist material is heated to about 80 to 170°C (claim 13). Mazed does not disclose that the photoresist material is heated to about 60-90°C (claim 14). Mazed does not disclose that the photosensitive material is positioned upside down near a heat source such as a hot plate during the step of melting (claim 15-16). Mazed does not disclose that the step of melting includes flowing a hot fluid or solvent vapor across the surface of the photosensitive material (claim 17). Mazed does not disclose that a gray scale lithography such as a half tone process or a modulated exposure masking process is performed (claims 18-20).

Feldman, in the abstract, and in col 8, lines 7-22, discloses that the photoresist is heated to about 115°C so as to cause a reflow in the photoresist (melting) to eliminate roughness. Feldman, in col 2, lines 43-49, in col 3, lines 20-23, and lines 32-40, and in col 4, lines 45-48, discloses that photoresist can be exposed (to form a pattern) using gray scale lithography, wherein the gray scale lithography can be performed using a mask from half-toning or using a mask having a variable amplitude transmission with continuous level phase transmission (modulated).

Art Unit: 1756

Therefore, it would be obvious to a skilled artisan to modify Mazed by employing the thermal treating temperature for the heat treatment process and the gray scale masks suggested by Feldman because Feldman, in col 4, lines 64-67, discloses that employing the gray scale mask enables the control of the light passing therethrough in a single structure of the mask, and in col 8, lines 7-14, discloses that heating to the temperature suggested for the thermal treatment process results in the elimination of obvious discontinuities existent in the photoresist layer.

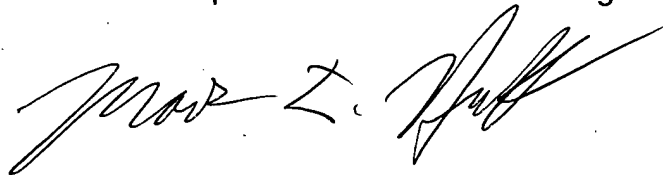
### ***Conclusion***

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daborah Chacko-Davis whose telephone number is (703) 306-5923. If the examiner is unavailable, you may contact her supervisor, Mark F. Huff at (703) 308-2464. FAX communications should be sent to the appropriate FAX number; (703) 872-9311 for After Final Responses only or (703) 872-9310 for all other responses. FAXES received after 4:00 P.M. will not be processed until the following business day.

dcd

no

September 30, 2003.



MARK F. HUFF  
SUPERVISORY CLIENT EXAMINER  
TECHNOLOGY CENTER 1700